

**CALFED Bay-Delta Program Project Information Form  
Watershed Program - Full Proposal Cover Sheet**

***Attach to the cover of full proposal. All applicants must fill out this Information Form for their proposal. Failure to answer these questions and include them with the application will result in the application being considered nonresponsive and not considered for funding.***

1. Full Proposal Title: A Management Program for *Tamarix* and *Arundo donax* on Cache Creek  
Concept Proposal Title/Number: Design, Development and Implementation ... #WSP01-0098

Applicant: Cache Creek Conservancy

Applicant Name: Jan Lowrey

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Fiscal Agent Name (if different from above): Same as above

Fiscal Agent Mailing Address: \_\_\_\_\_

Fiscal Agent Telephone: \_\_\_\_\_ Fiscal Agent Fax: \_\_\_\_\_ Fiscal Agent Email: \_\_\_\_\_

2. Type of Project: Indicate the primary topic for which you are applying (check only one)

\_\_\_\_\_ Assessment

\_\_\_\_\_ Capacity Building

\_\_\_\_\_ Education

☒ Implementation

\_\_\_\_\_ Monitoring

\_\_\_\_\_ Outreach

\_\_\_\_\_ Planning

\_\_\_\_\_ Research

3. Type of Applicant:

\_\_\_\_\_ Academic Institution/University

\_\_\_\_\_ Federal Agency

\_\_\_\_\_ Joint Venture

\_\_\_\_\_ Local Government

☒ Non-Profit

\_\_\_\_\_ Private party

\_\_\_\_\_ State Agency

\_\_\_\_\_ Tribe or Tribal Government

4. Location (including County): Capay to Woodland; Yolo County

What major watershed is the project primarily located in:

\_\_\_\_\_ Klamath River (Coast and Cascade Ranges)

☒ Sacramento River (Coast, Cascade and Sierra Ranges)

\_\_\_\_\_ San Joaquin River (Coast and Sierra Ranges)

\_\_\_\_\_ Bay-Delta (Coast and Sierra Ranges)

\_\_\_\_\_ Southern CA (Coast and Sierra Ranges)

\_\_\_\_\_ Tulare Basin (Coast, Sierra and Tehachapi Ranges)

5. Amount of funding requested: \$222,200

Cost share/in-kind partners? ☒ Yes \_\_\_\_\_ No

Identify partners and amount contributed by each:

USDA- ARS

\$750,000

County of Yolo

\$349,705

Yolo County Flood Control & Water Conservation Dist.

\$ 30,000

Cache Creek Conservancy

\$ 30,000

6. Have you received funding from CALFED before? \_\_\_\_\_ Yes ☒ No

If yes, identify project title and source of funds:

By signing below, the applicant declares the following:

1. The truthfulness of all representations in their proposal
2. The individual signing this form is entitled to submit the application on behalf of the applicant (if the applicant is an entity or an organization)
3. The person submitting the application has read and understood the conflict of interest and confidentiality discussion in the Watershed Program Proposal Solicitation Package and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent provided in the Proposal Solicitation Package.

Tan T. Lowrey  
Printed name of applicant

Tan T. Lowrey  
Signature of applicant

# A MANAGEMENT PROGRAM FOR *TAMARIX* SPP. AND *ARUNDO DONAX* ON CACHE CREEK

## 1. Project Description

### Background

Non-native invasive species (NIS), specifically *Arundo donax* and *Tamarix* spp., have been a part of the Cache Creek watershed for decades. Originally introduced as ornamentals and even recommended by government agencies for erosion control, these two Eurasian natives eventually worked their way into much of the watershed and particularly any disturbed riparian habitat along the creek. The banks of Cache Creek experienced disastrous erosion and loss of native vegetation during the flood event of January 1983. For various reasons the streambanks were only spottily repaired and colonization by NIS expanded. 1986 delivered yet another damaging flood event which exacerbated the erosion and loss of native vegetation, especially cottonwoods, willows and oaks. The following seven years brought drought to the watershed and native plants again suffered while the drought-adapted *Tamarix* and *Arundo* thrived. NIS populations slowly swelled within the low flow channels where there was some moisture and little competition. As the NIS infestation expanded, reaches of the channel became constricted, stream velocities increased and flood-flows were randomly deflected causing further erosion.

After several years of wet winters, the Cache Creek riparian corridor is now infested with NIS which are crowding out the remaining native vegetation, building mid-stream islands, disrupting the flow regime and increasing flooding on adjacent lands. *Tamarix* and *Arundo* are efficient sediment traps which can build islands over time to a height of 10 feet. The channel near the city of Woodland is now constricted by and overgrown with NIS which significantly decreases the floodway capacity. *Tamarix* and *Arundo* seem to remain in the botanical background until populations reach a critical mass and then quickly spread to dominate a watershed. We have reached that critical stage in the lower reaches of Cache Creek.

To address the problem, in 1997 the Cache Creek Watershed Stakeholders Group formed a committee to address *Tamarix* concerns, and the Cache Creek Conservancy (Conservancy) applied for a CALFED grant to conduct studies of removal and revegetation methods. The proposal was not funded. In 1999 the committee agreed that *Arundo* was equally destructive and reapplied to CALFED in an expanded proposal that included both non-native species. By that time CALFED had specifically targeted both species for removal on Cache Creek: "Of particular importance is the control of the spread of tamarisk and giant reed, two introduced species that displace native flora, offer marginal value to fish and wildlife, and cause channel instability and reduced floodway capacity." (Strategic Plan for Ecosystem Restoration 1999, p 84). Again the proposal received a high score but was not funded. At that point the Conservancy decided to move forward on its own, even with limited funding. In late 1999 a demonstration NIS removal and control project was initiated on 16 acres of the Cache Creek Nature Preserve. This highly successful pilot project forms the basis for this expanded NIS removal and revegetation, maintenance and monitoring program on lower Cache Creek.

### Watershed Partners

As noted above, the need for the proposed project arose from the local watershed group in which the Cache Creek Conservancy has participated since its inception in 1996. The Conservancy even provided carryover funding for their Watershed Coordinator's position for several months this year until longer term funding could be found by the Yolo County RCD. We will keep the stakeholders informed of the progress of the project at their meetings. We have already held smaller meetings for landowners in our project area and will continue to do so. We will also work closely with the Capay Valley Watershed Coordinator, who is seeking CALFED funding for the Capay Valley Watershed Improvement Program. He plans to use our NIS removal protocol at the two demonstration sites they hope to establish. These sites will be located upstream of our project area. We are also involved with and support the Capay Valley Vision, Inc., a newly formed non-profit, which is seeking CALFED funding to provide a unified vision for the future of the Capay Valley region. In addition we are coordinating with the Bureau of Land Management, which is planning to begin exotics removal work on upper Cache Creek and lower Bear Creek, a Cache Creek tributary in the upper watershed, and the American Land Conservancy which has started NIS removal on lower Bear Creek.

## The Proposed Project

The Conservancy proposes to partner with local landowners, Yolo County Flood Control and Water Conservation District, the County of Yolo, the Wildlife Conservation Board, USDA-ARS and CALFED in a large scale effort to remove and control *Tamarix* and *Arundo*, encourage re-vegetation with native riparian species, and conduct long term monitoring along a 14 mile stretch of lower Cache Creek. The proposed project will enhance and restore in-stream aquatic, shaded riverine, and seasonal wetland habitats for the fish and wildlife in the Cache Creek Watershed and has the long-term goal of improving flow characteristics and bank stabilization of the creek and ultimately removing the threat of *Tamarix* and *Arundo* infestation to the Bay-Delta.

The lower section of the creek was chosen for five reasons: 1) heavy infestation by both NIS species; 2) support of the stakeholders and willingness of local landowners to participate; 3) maximum immediate flood relief for the city of Woodland; 4) technical feasibility for large-scale removal due to the relatively flat gradient; 5) infrastructure in place for long term management and monitoring.

The project is divided into four components: 1) NIS removal; 2) post-removal management; 3) monitoring; 4) community outreach. We are seeking funds from the Wildlife Conservation Board and Yolo County Flood Control & Water Conservation District for #1-NIS Removal. In this proposal we ask CALFED to fund #2-Post-removal Management. The County of Yolo and the USDA-ARS have agreed to fund #3-Monitoring, and #4-Community Outreach will be funded by the Cache Creek Conservancy, County of Yolo. USDA-ARS, and we are asking for limited funding from CALFED.

### Task 1: *Tamarix* and *Arundo* Removal

The project proposes to remove approximately 300 acres of *Tamarix* and *Arundo* on the property of willing landowners on the creek between the Capay region and upstream of the Interstate 5 Bridge (see Figure 1- map). Most sites and permission to proceed have already been secured. The Resources Manager for Yolo County does not anticipate special permits needed for this project, but any permitting requirements that might arise can be accommodated within the existing regional, state and federal permits approved for the Cache Creek Resources Management Plan.

The removal methodology is based on the pilot project ongoing at the Cache Creek Nature Preserve. Each year for three years, starting in the late summer, approximately 100 acres of *Arundo* and *Tamarix* along the banks and on gravel bars in the channel will be mechanically removed with specially designed equipment and the biomass left in place. At sites where mechanical removal is not feasible manual methods will be used. One herbicide spray application will be applied within 30 days (early fall spraying results in better transfer to the rhizome mass). In addition, for *Tamarix*, depending on the size, basal bark herbicide treatments and cut and paint techniques will be employed.

### Task 2: Post-Removal Management

An essential component for success of NIS control projects is the management system, which has often been weak or non-existent in other organizations' removal efforts, including some on Cache Creek. These weeds routinely shed hundreds of thousands of seeds per plant and sprouts from small stem segments. Our removal program on 100 acres/year will be followed up in the spring with a resprout spray program, which will consist of up to six treatments spaced 21-40 days apart for *Arundo* and fewer treatments as needed for *Tamarix*. Follow-up spot spraying will continue at the sites as needed for the life of the grant.

The knowledge gained regarding initial herbicide application rates, respray rates and frequency during the grant, and hopefully beyond, should provide vital information for other NIS control programs. We have found little data available on the most economical methods of control as opposed to the fastest methods. Our project will develop protocols that can be implemented by private landowners with limited funding on other creek reaches.

Management includes revegetation and erosion control. After removal, using CA Conservation Corps crews, we will conduct revegetation programs at appropriate sites. Our research has shown that revegetation by natives occurs readily in sites that are not totally stripped of all vegetation upon NIS removal, but in areas dominated by NIS, a revegetation program may be important to prevent erosion and recolonization of non-natives.

Use of chemicals at some level in controlling NIS appears unavoidable, but in conjunction with our partners we also plan to implement an integrated pest management (IPM) approach to the problem. Cache Creek is one of three test sites chosen by USDA-ARS (Agricultural Research Service) for implementation of *Tamarix* biocontrol. The biological agents (leaf beetles) have already demonstrated great success in trials conducted in six southwestern states where they have successfully overwintered and caused nearly complete defoliation of *Tamarix* under caged conditions. Once

released, their activity will result in greatly reduced levels of herbicide necessary for long term management. Biocontrol offers a “non-polluting and inexpensive method for reducing the abundance of saltcedar [*Tamarix*] without harming the native plant or animal communities” (Dudley et al. 2000). Continuous monitoring of these biological control agents and delineation of the beetle spread and impact will be conducted throughout the watershed for several years to come. The study of this *Tamarix* biocontrol agent has been underway for nearly 15 years by USDA-APHIS, and, after public hearings, the Yolo County Board of Supervisors voted to support the project on Cache Creek.

### Task 3: Monitoring

To document changes in vegetation and geomorphology over time, Yolo County will establish 13 permanent transects along the lower creek in 2001 (see Figure 1). Yolo County has committed funds for the Technical Advisory Committee (three independent scientists, who advise the county on Cache Creek related matters) to monitor these transects for 25 years. This will include vegetation surveys and geomorphological profiling every two years. Twelve of the 13 transects fall in our proposed program area and will provide an excellent long-term monitoring component to this project. Yolo County has also authorized yearly stereoscopic photography to create a digital terrain model to which the color aerial photos, hyperspectral scans, and transect monitoring results can be ortho-rectified and geo-referenced. This will create a valuable digital library of geomorphic data to monitor changes in the creek over time.

In addition, the USDA-ARS Exotic and Invasive Weeds Research Unit at UC Davis has completed two seasons of employing GPS to count *Arundo* resprouts at our demonstration removal site and have agreed to continue this work at least four removal sites included in this proposal. They will also analyze the data gathered. The initial data analyzed indicates that the number of *Arundo* resprouts drops significantly after the first year post-removal provided that a spraying program is in place.

At the watershed level the USDA-ARS will also monitor *Tamarix* and *Arundo* populations, as well as yellow star-thistle and various native species, via computerized aerial color photography (*Tamarix*) and hyperspectral imaging (*Arundo*) for 10-15 years. The data gathered will be used in GIS models for assessment and predictive purposes. This is being done to accurately assess the impact of the biological control agents on both target and non-target species. In addition, periodic wildlife assessments will be conducted to determine how potential changes in vegetation cover are affecting critical bird and mammal species. The funding for the aerial photography is provided by Yolo County and the Cache Creek Conservancy, which began the flights four years ago and will continue them for 25 years.

### Task 4: Community Outreach

Community outreach is essential for the success of this project. Part of the Project Coordinator’s duties will include making on-site visits to riparian landowners as well as conducting workshops and community presentations on how to implement biotechnical erosion control methods, and plant and maintain native vegetation. The coordinator will also act as liaison with the watershed partners to keep them informed of project progress and to stay up-to-date on their activities.

To assist in outreach Yolo County has committed funding for a guide to bank stabilization on Cache Creek. This guide will include a section on techniques for *Tamarix* and *Arundo* removal, suggested methods for revegetation with native species, erosion control examples and plans for long-term management of NIS. It is designed to be a straightforward, how to manual specifically for landowners who want to better manage their creekside property. USDA-ARS will also contribute to this outreach effort by making their research results available to the landowners via flyers, news releases and community meetings. Finally, *Meanderings*, a publication of the Cache Creek Conservancy and Yolo County which is sent to all creekside landowners, is an excellent means of disseminating information as is the Conservancy’s web site (cacheconserv.org).

### **Conclusion**

The goal of this project is the development of a long-term management program for the control of *Tamarix* and *Arundo* in Cache Creek and to serve as a model for other watersheds. With solid community support the Cache Creek Conservancy has assembled a group of participants who can make this happen: CALFED, Wildlife Conservation Board, USDA-ARS, Yolo County, Yolo County Flood Control District, the Conservancy and local landowners. Invasion by these two non-native exotic species is a problem that can and must be controlled on Sacramento River tributaries such as Cache Creek to minimize the damage these invaders, if left unchecked, are capable of inflicting on the Bay-Delta.

## 2. Qualifications and readiness to implement the project

**2a.** The Cache Creek Conservancy will administer the funds and conduct the project. Incorporated in early 1996, the Conservancy is a 501(c)(3) nonprofit corporation with a mission of restoration, education and habitat enhancement. Governed by a 16-member Board of Directors, the Conservancy manages two restoration sites for the County of Yolo including the 130 acre Cache Creek Nature Preserve, and has ongoing restoration and erosion control projects on private cooperators' land. Over the past 18 months Conservancy staff has managed grants and allocations in excess of \$500,000 for improvements at the Nature Preserve and other project sites. Jan Lowrey, Executive Director, has many years experience in project management, is a fourth generation land owner along Cache Creek and has 20 years experience in farm management, stream bank restoration, streambed management, pesticide handling and application, and heavy equipment operation.

**2b.** David Morrison, Assistant Director of Planning and Linda Fiack, Resources Manager, for the Yolo County Department of Planning and Public Works are in charge of environmental compliance and land use issues and have many years experience in environmental planning and permitting. Mr. Morrison administers the Cache Creek Resources Management Plan for Yolo County which encompasses the project area. He has been involved with efforts to secure funding for NIS removal since 1997. Ms. Fiack oversees the Technical Advisory Committee, a panel of scientists who review permit requests for work along Cache Creek and will conduct the transect monitoring program discussed in Section 5.

We have worked closely with the leading experts in the field of *Tamarix* and *Arundo* biology and management. Mr. Lowrey is a member of the CA Exotic Pest Plant Council, Team Arundo del Norte and the Salt Cedar Consortium. Dr. Joe di Tomaso, the Non-crop Weed Ecologist for UC Davis Cooperative Extension, has advised us on technical issues regarding NIS and will continue to do so. Dr. Carla d'Antonio and Dr. Tom Dudley of UC Berkeley, and Dr. Ray Carruthers and Dr. David Spencer of USDA-ARS are principal investigators in the USDA grant that will be conducted concurrently with our proposed project. Contact with these organizations and individuals will insure that we are aware of the latest research in the NIS field, and they will help disseminate the results of our project.

**2c.** As mentioned in Section 1 and discussed in more detail in Section 4, the Cache Creek Conservancy began a demonstration NIS removal and management project on 16 acres at the Cache Creek Nature Preserve in November 1999. The protocol developed in this ongoing pilot project will form the basis of the larger project for which we are seeking funding.

The Conservancy has implemented several substantial restoration and erosion control actions along Cache Creek, including a \$200,000 project funded by the Wildlife Conservation Board, a \$225,000 project funded by the Central Valley Regional Water Quality Control Board, and a \$45,000 project funded by the Rumsey Committee Fund (Rumsey Band of Wintun Indians).

## 3. Budget- see attached budget forms

The overall budget for this program is comprised of CALFED's requested contribution and the in-kind and matching contributions of our partners. Of the nearly \$2 million budgeted for this project CALFED is being asked to fund approximately 10%. Please see the attached overall budget spreadsheet for an accounting of all contributions.

Calculated costs for CALFED funding were derived directly from implementing the demonstration project at the Cache Creek Nature Preserve. By actually removing and controlling *Arundo* and *Tamarix* on the project site, we have developed costs per acre for removal and control. We have done a portion of the work, tracked our costs and plugged them into this proposal. The costs per acre include a supervisor, applicator, needed equipment, materials and necessary training. Please note that by using a local farmer to accomplish this work we have significantly reduced costs as compared to other similar projects, instituted economies and efficiencies that have not been used elsewhere and have thereby improved the cost/benefit ratio.

Materials (irrigation, revegetation plants and other needed supplies) will be purchased directly by Conservancy staff and installed/planted by the California Conservation Corps, Yolo County crew.

Education and Outreach will include visits to landowner's sites for individual consultation and group workshops on erosion control and revegetation. There will also be landowner and stakeholder presentations to update the community on project progress. This work will be accomplished by the Project Coordinator who will also be overseeing the day to day operations of the overall program. CALFED will be funding 110 hours per year @ \$30/hour of the Coordinator's time.

#### **4. Technical Feasibility**

**4a.** The demonstration NIS management project at the Cache Creek Nature Preserve, based on research and consultation with experts in the field of invasive weed control, was started in late 1999. It was also designed not to repeat the mistakes of at least two other removal projects on Cache Creek, which included little or no follow-up spraying and no monitoring after the initial cutting. On the 16 acre demonstration site *Tamarix* and *Arundo* were mechanically mulched with a specially designed mower and the resulting biomass left in place. In areas that the mower couldn't access the plants were manually cut. Several months later as resprouts appeared, a herbicide program was implemented, which involved up to six treatments over an eight month period. Our larger proposed project will be based on the success of the pilot project with modifications as necessary to accommodate varying conditions on different sections of the creek. The Conservancy staff stays up-to-date on the latest research through professional organizations and contacts, and the proposed project will be modified as needed if more effective methods and materials become available.

A local family farming operation will contract to do the actual equipment work and herbicide applications. These progressive farmers will obtain the necessary permits and equipment, provide operators, maintenance and repairs as necessary. The Conservancy has found that employing local people increases the participation by other riparian landowners, decreases land access problems and greatly reduces costs. This little-tapped reservoir of weed control expertise can add greatly to the efficiency and effectiveness of NIS management projects.

**4b.** *Tamarix* and *Arundo* are notoriously difficult to control; in fact, there is little talk of total eradication any more, because it appears unrealistic. Most of the NIS projects implemented have been lacking in long term management. Our project is innovative because we have the means to conduct a thorough removal, revegetation and respray program and then monitor those results for many years with funding from USDA-ARS and Yolo County.

Working in conjunction with the USDA-ARS biocontrol project to develop a truly integrated pest management program will result in completely new knowledge. It is not expected that the biocontrol organism can totally control *Tamarix* by itself, but in conjunction with initial "heavy artillery" in the form of mechanical removal, replanting and spraying programs, it is hypothesized that the introduced organisms will eventually keep the *Tamarix* population in check.

The hyperspectral imaging that the USDA-ARS will employ is cutting edge technology that scans 256 different spectral bands. This scanned data is computer analyzed and the signatures can be overlaid on the digital terrain model. The image analysis will provide a means of quantifying the extent and location of different plant populations on the creek at a level never achieved before.

**4c.** Three years of funding from the Wildlife Conservation Board and CALFED will lay the foundation for a solid NIS management program on 300 acres. It is anticipated that each subsequent year post-removal resprout will require less and less active maintenance, but landowners must participate in the ongoing management for the project to be a long-term success. Also it is hoped that landowners in other reaches who don't participate in our initial project will be interested in starting their own management programs when they learn of the results. Community outreach is an essential component of the project to keep landowners up-to-date on the latest control techniques, and, as discussed above, there is an ongoing local commitment by the Conservancy, Yolo County and the Cache Creek Watershed Stakeholders to continue this educational work. It is entirely possible that we may approach CALFED for more funding to augment the long-term management of NIS on the creek. It is impossible

to anticipate exactly what might be needed at this stage; so much depends on the results of the three year project and the monitoring that will continue beyond.

## **5. Monitoring**

**5a.** The goal of this project is to control the level of *Arundo* and *Tamarix* on 300 acres of lower Cache Creek. Our performance measures, defined by CALFED as “a means to gauge the progress of an action” (Watershed Program Plan, Final Programmatic EIS/EIR Technical Appendix, July 2000) include meeting our timetable for NIS removal, herbicide spray, revegetation, monitoring, and community outreach. The success of meeting our timetable will be documented in our quarterly reports to CALFED.

Our progress will also be gauged by our monitoring protocol discussed in 5d. CALFED has emphasized the importance of adaptive management, and we will utilize this concept as our project progresses. For instance, if, after a year of NIS management, we decide a certain approach did not work as planned, we will re-evaluate the task and modify it as needed. CALFED will be appraised of this in the reporting process. This could be especially true of specific herbicides, application techniques and application timing.

**5b.** There are three NIS removal and management projects planned in the upper reaches of Cache Creek and its tributaries. The Capay Valley Watershed Coordinator of the Cache Creek Watershed Stakeholders Group has applied for CALFED funds and plans to use our removal and management protocol to set up two demonstration projects in the middle section of the creek. The Bureau of Land Management is beginning exotics removal work on upper Cache Creek and lower Bear Creek, a Cache Creek tributary in the upper watershed, and the American Land Conservancy has started NIS removal, including yellow star-thistle, on upper Bear Creek. The Cache Creek Conservancy is working closely with all three projects and has included letter of support from the organizations. The USDA-ARS computerized aerial monitoring and hyperspectral imaging will include most of the creek and provide data that includes all four projects.

**5c.** Riparian landowners who participate in the project and others who become interested in NIS removal as part of our community outreach will receive assistance in setting up ongoing NIS management protocols, including monitoring, on their land through landowner meetings, on-site visits and workshops by the Project Coordinator, and the guide to bank stabilization. By making local landowners active participants in the project the goal of long-term management will be assured. We must think well beyond this three year project to insure NIS control in the watershed.

**5d.** The project monitoring protocol includes:

1) site monitoring. The Project Coordinator will be in charge of regular surveys of the study area during the three year project to insure scheduled project implementation.

2) computerized aerial photography (1" = 1,000 ft.), digital terrain model and hyperspectral imaging. These methods will allow us to quantify the level of NIS infestation before the program begins and annually thereafter for at least ten years. They will also document the extent of native revegetation in the removal areas.

3) *Arundo* survivorship study. The USDA-ARS Exotic and Invasive Weeds Research Unit will conduct a study at four of our sites. Before application of management techniques the researchers will locate clumps of *Arundo* and determine their exact position using a Trimble XRS Pro GPS unit. They will then count the number of existing stems/shoots. After treatment, at the start and end of each growing season for five years each clump will be located and the number and location of each new shoot determined. The mean number of sprouts for each transect will be calculated based on the clumps originally identified. Survivorship of *Arundo* rhizomes following application will be estimated using regression analysis. An identical procedure will be followed with clumps of non-treated *Arundo*, so comparison can be made with the treated group.



4) biocontrol monitoring. The USDA-ARS will conduct detailed monitoring of *Tamarix* in conjunction with its biocontrol studies. They are particularly interested in the interactions between the biocontrol agent and our removal and management techniques.

5) transect monitoring. Yolo County's Cache Creek Technical Advisory Committee is in the process of establishing 13 permanent transects along lower Cache Creek (see attached map for locations). The transects will run high bank to high bank, and 12 of the 13 transects lie within our removal area. The transects will be monitored bi-annually. They will be surveyed to ground truth the county's digital terrain model, which annually provides information on geomorphological changes in the creek.

6) bird surveys. A UC Davis graduate student has set up a protocol for monitoring birds at the Cache Creek Nature Preserve and conducted two surveys. The Conservancy will continue to fund the bi-annual surveys to see what effect NIS removal has on bird diversity and numbers at the Nature Preserve.

**5e.** The removal of *Tamarix* and even *Arundo* has been opposed by some landowners outside our project area principally because of its perceived erosion control value. In our study area the large majority of landowners have now come to realize that these invasive species need to be controlled, but there has been more controversy further upstream especially in the Capay Valley. Publication of the results of our data collection and analysis will be very helpful in educating these landowners about the importance of a NIS management plan. Community members will have access to our results, including those of our partners, at various stakeholder meetings and also via *Meanderings* and the Conservancy web site ([cacheconserv.org](http://cacheconserv.org))

## **6. Scientific Basis for Restoration Action**

**6a.** *Tamarix* and *Arundo* have been in the Cache Creek Watershed for decades, but the general consensus of the riparian landowners is that NIS levels have increased significantly in the last 10 years. The Yolo County Flood Control and Water Conservation District (YCFCWCD) was the first organization to recognize the problem because the *Tamarix* had begun to impede water flow. By the mid-1990s several assessments had been completed which documented the threat of NIS on the creek: Draft Cache Creek Environmental Restoration Study (US Fish and Wildlife Service 1995), Reconnaissance Report: Cache Creek Environmental Restoration (US Army Corps of Engineers 1995) and Technical Studies and Recommendations for the Lower Cache Creek Resource Management Plan (Yolo County Community Development Agency, 1995). In 1997 Yolo County and the Cache Creek Conservancy began their aerial color photography of the creek timed to show *Tamarix* in full bloom have continued annually since then. A visual assessment of the increase in *Tamarix* in many areas of the creek could be made just from looking at the photos, but now USDA-ARS has computerized them, they will be able to conduct a quantitative assessment of the increase in infestation. In 1999 CALFED published its Strategic Plan for Ecosystem Restoration and listed control or eradication of non-native riparian plants and revegetation with native plants as a Stage 1 Action for Cache Creek (p.83).

**6b.** The Cache Creek Conservancy used the assessments listed in 6a to help establish its goals and objectives for this NIS management proposal, and the assessments all document the fact that NIS are detrimental to the creek for a wide variety of reasons and need to be removed. The solution, however, is complex, and the Conservancy has studied projects carried out on Cache Creek and other waterways throughout the west in developing its protocol. For example, in 1992 YCFCWCD employed crews to cut down large infestations of *Tamarix* along a two mile stretch of the creek, but they didn't follow up with herbicide applications or replant with natives. The non-natives, including *Arundo*, returned in greater numbers than ever within three seasons.

**6c.** The following are among the scientific assumptions, with sample references, that were used to develop our project:

NIS decrease native plant diversity (Faull 1998)  
NIS colonize rapidly in disturbed habitats (Bell 1997) (Rieger and Kreager 1989)  
NIS are not good for bank stabilization (Wiesenborn 1996)  
NIS decrease animal diversity (Di Tomaso 1998, Vartanian 1998)  
NIS alter stream flows (Dudley et al. 2000, Di Tomaso 1998)

These assumptions have been documented at various sites, and the scientific community by and large accepts them as reality. In the Cache Creek Watershed, however, there are still some landowners who want to keep NIS along their banks for erosion control. These people are not willing, for some obvious reasons, to step back and look at the larger bank stabilization issues caused by these plants beyond their own property. However, through a number of landowner meetings over the last two years we have gained almost complete buy-in for our NIS removal and management project.

**6d.** The management and community outreach actions we are proposing to CALFED are consistent with the scientific assumptions and previous assessments made regarding the Cache Creek Watershed discussed above. One assumption that is generally held that we are not following in the NIS removal phase of our project (funds requested from Wildlife Conservation Board) is that of beginning at the top of the watershed and working down. This concern was addressed in 1. Project Description. “The lower section of the creek was chosen for five reasons: 1) heavy infestation by both NIS species; 2) support of the stakeholders and willingness of local landowners to participate; 3) maximum immediate flood relief for the city of Woodland; 4) improved technical feasibility due to the relatively flat gradient; 5) infrastructure in place for long term management and monitoring.” The “top down” is the ideal, but the realities are more complex. Community support is a critical component of the success of this action, and we have worked for several years to gain it in the lower part of the creek. We believe that with a good management program in place and continued landowner participation that NIS can be controlled on the lower creek. Meanwhile, other control programs that we discussed are getting started farther upstream and will dovetail with ours. The programs managed by BLM and the American Land Conservancy are starting in the uppermost reaches of Tamarix and Arundo infestation and will remove that propagule source

**6e.** The post-removal NIS management actions we are proposing for funding by CALFED consists of two parts: respraying of NIS resprouts and revegetation with native species where appropriate. Our extensive search of the literature, participation in organizations such as CA Exotic Pest Plant Council, Team Arundo del Norte and the Salt Cedar Consortium, and our partnership with leading experts in the field of NIS control have provided the project with virtually all the baseline knowledge available. Details of how to implement our actions will vary from other projects due to site specific circumstances. A very important contribution of USDA’s partnership is that world renowned experts in the field of NIS control will be working on Cache Creek and will be available to Conservancy staff for consultation. They will be monitoring our removal work and suggesting adaptive improvements as the project progresses. The long-term monitoring aspect of the project should provide data that substantially enhances the basic knowledge now available.

## **7. Meeting CALFED Objectives**

**7a.** As stated in the Project Description *Tamarix* and *Arundo* have reached a critical mass on lower Cache Creek. A management plan will “implement a strategy that will ensure support and long-term sustainability” of this local watershed project. In collaboration with USDA-ARS and the Yolo County TAC we will “develop watershed monitoring and assessment protocols”, and our community outreach component is intended to ensure that the community is involved and engaged. We see our proposed project, with the eminent individuals included in the partnerships as meeting all of the Watershed Program Objectives. Unless the NIS situation is controlled, the problems we are experiencing on Cache Creek will be heading toward the Delta. The project also fulfills CALFED’s Ecosystem Restoration Program goal #5: “Prevent establishment of additional non-native species and

reduce the negative biological and economic impacts of established non-native species.”(Strategic Plan for Ecosystem Restoration 1999, p.27). More specifically:

“Of particular importance is the control of the spread of tamarisk and giant reed, two introduced species that displace native flora, offer marginal value to fish and wildlife, and cause channel instability and reduced floodway capacity. Some rivers, such as Stony Creek and Cache Creek and the lower San Joaquin River, have undergone large expansions in the past 10-15 year. A combination of large-scale eradication pilot projects and targeted research on several streams will help to temporarily reduce the rate of expansion of their range, identify the most vulnerable stream environments, and determine whether valley-wide eradication or suppression measures are warranted or feasible.” (SPER, 1999, p.44).

Heavy infestation of NIS can affect the hydrology of the creek by increasing sediment deposition, which, in turn, can substantially reduce channel capacity, increasing the potential for levee overtopping and subsequent failure. Of most immediate concern is the City of Woodland, but the developing scenario on Cache Creek is a mini-view of what could happen to the waterways and levees in the Delta with a heavy build-up of NIS there.

In terms of water quality *Arundo* especially provides little shading over the creek, which results in higher water temperatures and altered water chemistry. The shaded riverine habitat offered by native willows and cottonwoods improves the aquatic environment for fish and the riparian environment for a wide variety of wildlife. *Tamarix* teams up with *Arundo* to create mid-stream islands that re-direct flood flows into unprotected banks. As these banks collapse the sediment load is greatly increased and transported downstream. Removal of NIS will substantially eliminate these “artificial” islands, thereby decreasing erosion and, over time, improving water quality.

In addition, both species use large amounts of water. For example, it has been estimated that *Arundo* uses about 5.6 acre-feet per year, while native species use only about one third of this amount (Iverson 1993). This is water that could be available for other beneficial uses like groundwater recharge and ultimately drinking water. BLM representatives speculate that removal from Bear Creek, a Cache Creek tributary, could dilute the alkaline constituents in the water by significantly increasing groundwater levels. By lowering the level of these constituents, such as boron, the water quality of Cache Creek and beyond could be greatly improved.

**7b.** The Cache Creek Stakeholders Watershed Group, with Cache Creek Conservancy taking the lead role, has been seeking funds to control NIS since 1997. This has been a very local initiative. The Conservancy has worked out many of the management details by funding and implementing a removal project at the Cache Creek Nature Preserve, and, as a result, we now have the support of the great majority of landowners on the lower portion of the creek to implement a larger NIS removal and management plan. We are working closely with other proposed NIS plans in the upper watershed, and we are partnering with local, state and federal agencies on this project. As stated above, the project fits very well with the overall as well as the specific goals and objectives for CALFED.

**7c.** The lead agency for environmental compliance on projects on Cache Creek is the Yolo County Department of Planning and Public Works. They do not anticipate that this project needs any permits, but if for some unknown reason we should, any potentially necessary environmental documents (including an EIR) are certified and in place with our partner Yolo County, as are all potentially necessary local, state and federal permits.

## **8. Other Important Aspects**

As can be seen from the project proposal and the budget, we are asking the California State Wildlife Conservation Board (WCB) to fund a large part of this project. We had originally asked them to fund the entire program. The WCB staff consider it a high priority for funding, but they have stated that additional funding is necessary from another source for the proposal to move forward, so we have turned to CALFED. As a matter of policy, WCB staff will not submit a letter of intent agreeing to fund if CALFED funds, but they believe that our

requested funding by CALFED will be viewed very favorably by the WCB members at their meeting in August and will result in a greater chance for having the project funded. Cache Creek Conservancy has been working for some four years to form a coalition of landowners, agencies, local government and state government to fund and implement this project. We see CALFED's approval of this proposal as the keystone for the success of the coalition.

Please note the attached spreadsheet which spells out all coalition funding for our project. CALFED is being asked to provide only about 10% of the total being expended. We have worked diligently to leverage CALFED dollars with those of our partners to create a broad based, multi-discipline program that will fulfill the goals and objectives of the Bay Delta Program

**The Cache Creek Conservancy agrees to comply with the standard conditions of Section 8: Terms and Conditions for CALFED Funding Agreements in the Watershed Program Proposal Solicitation Package.**

## Literature Cited

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## Figures

## **Required Forms**

## **Letters of Support**



**Sample Landowner Permission Forms for Participating in Project  
(20 on file with Yolo County)**

**Notification Letter to Yolo County and  
Response Letter to Cache Creek Conservancy**

## **Budget Forms**

## Cache Creek Conservancy: Tamarix and Arundo Management Project

		Task Description	Completion Date	Match Funds	CALFED Funds	TOTAL
<b>Task 1</b>		<b>Administration:</b> Conservancy Executive Director will administer the project. Recordkeeping will be done by the Conservancy. Project Coordinator (P.C.) to run daily activities of project	Dec. 2004	\$75,070	\$20,200	\$95,270
	<i>Task 1a:</i>	P.C.-oversee subcontractor				
	<i>Task 1 b:</i>	P.C.-liaison with landowners				
	<i>Task 1 c:</i>	P.C.-write reports & conduct presentations				
		<b>Task Product(s):</b> Proper oversight and supervision of the various components of program. Coordination with partners. Cogent reports and presentations.				
		<b>Success Criteria:</b> Weekly, monthly and seasonal acreage removal goals; timely and efficient applications; response from private landowners and other partners				
<b>Task 2</b>		<b>Post Removal Control:</b> Following mechanical and manual removal, herbicide will be applied to resprouting Arundo to neutralize rhizome mass	Nov. 2004		\$165,000	\$165,000
	<i>Task 2a:</i>	Assess efficacy of concentrations of herbicides used, rates applied and height of regrowth treated.				
	<i>Task 2b:</i>	Monitor treated area to assure respray in timely manner.				
	<i>Task 2c:</i>	Apply herbicide to Tamarix concurrently with cut stump method				
	<i>Task 2d:</i>	Apply herbicide to smaller Tamarix concurrently with basal bark method				
		<b>Task Product(s):</b> Long term management of target species populations				
		<b>Success Criteria:</b> Applications confirmed to follow label directions and regulations, appropriate dieback of NIS resprouts, decreasing populations with each treatment				

<b>Task 3</b>		<b>Materials Acquisition:</b> Acquire necessary materials and supplies for project	Sept. 2004		\$21,000	\$21,000
	<i>Task 3a:</i>	Acquire irrigation supplies				
	<i>Task 3b:</i>	Acquire native plants for revegetation program				
	<i>Task 3c:</i>	Acquire other necessary supplies				
		<b>Task Product(s):</b> Irrigation supplies, revegetation plants, other supplies				
		<b>Success Criteria:</b> Timely acquisition of all supplies and being on budget				
<b>Task 4</b>		<b>Community Outreach:</b> The P.C. will conduct workshops for landowners/public, make site visits and hold meetings with landowners.	Dec. 2004	\$20,000	\$10,000	\$30,000
	<i>Task 4a</i>	Conduct on-site workshops for landowners/public				
	<i>Task 4b</i>	Make site visits to consult with landowners				
	<i>Task 4c</i>	Conduct community/landowner update meetings				
		<b>Task Product(s):</b> Timely completion of tasks				
		<b>Success Criteria:</b> Satisfied riparian landowners				
<b>Task 5</b>		<b>Reporting and Presentations</b>	Dec. 2004		\$6,000	\$6,000
	<i>Task 5a:</i>	Quarterly progress reports: progress reports on project implementation, including financial status, milestones reached, products complete, and general assessment of overall progress, including problems encountered or anticipated.				
	<i>Task 5b:</i>	Draft final report: Draft report summarizing the project implementation, achievements, product deliveries, financial status.				
	<i>Task 5c:</i>	Final report: Revised report incorporating comments from the Contract Manager and others				
	<i>Task 5d:</i>	Presentations: at least one final summary presentation to CALFED				
		<b>Task Product(s):</b> reports				
		<b>Success Criteria:</b> approval by CALFED				
		<b>Totals:</b>		\$95,070	\$222,200	\$317,270

**Subcontractor: Yolo Vineyards Estimated Budget**

<b>Task Description</b>		<b>Subcontract</b>	<b>Match</b>	<b>CALFED</b>	<b>Total</b>
Task 2-Post-removal control		\$165,000		\$165,000	\$165,000
					\$165,000